

**Proceedings of the Environmental Protection Agency
PUBLIC MEETING ON WASTE LEACHING
Session III - Leaching Science**

International Perspective of Leaching Science - Hans van der Sloot

Hans van der Sloot, Netherlands Energy Research Foundation (NERF), discussed the science of leaching from the international perspective, concentrating on activities in the European Union. He said that the main concerns that we face in the field of waste leaching estimation are:

- there are too many leaching tests addressing the same question,
- the relationship between the test conditions and actual field conditions that we are trying to simulate are too limited, and
- we are not taking advantage of the vast amount of leaching test data that are generated annually in the industry.

The international Network Harmonization of Leaching/Extraction Tests effort has several goals, including:

- Identification of needs in relation to leaching test use and interpretation.
- Comparison of different leaching test methods currently used or proposed in one specific field.
- Horizontal comparison of leaching test methods between different fields.
- Evaluation of leaching test data, interpretation and modeling for environmental assessment.
- Development of cost efficient quality control systems through a hierarchy in testing.

As a result of this effort, a leaching test hierarchy has been adopted by the European Community under standard TC 292. It consists of:

- Characterization test or leaching behavior test.
- Compliance test
- On-site Verification test

The Characterization test provides basic information about the waste, and how it behaves under different conditions, as a function of time. The first step in this test is to describe the utilization scenario, e.g., co-disposal, monofill, followed by waste characterization, and determination of the stresses or influences that effect that waste in that utilization scenario. The next step is to do the leach testing, followed by modeling the leaching behavior. The Characterization test may take a few days to several weeks to complete, and will tell you the key issues that need to be focused on, or whether more information is needed. Dr. van der Sloot presented examples of characterization testing that has been conducted in the European Community, showing a wide range of materials. He made the point that there are a limited number of parameters that control leachability, and that you frequently see common behaviors that are related to common

characteristics, such as the role of organic matter in soil and compost matrices. He pointed out that for predominantly inorganic materials, you need to evaluate the entire leaching curve (concentration vs. pH) to evaluate the chemistry of the system. In addition, it is important to determine the “pH domain”, the most common pH range for that waste.

The Compliance test does not necessarily have to be a leaching test, but does need to provide data that can be compared to the Characterization test data. This test should take no more than 2-3 days to complete, and is used to determine if a waste is behaving as predicted by the Characterization test. Dr. van der Sloot presented examples of compliance testing that has been conducted in the European Community, again showing a wide range of materials. Refer to Dr. van der Sloot's presentation materials to view these leaching graphs.

The On-site Verification test should be able to be completed within an hour, and is used in the field to verify or refute that the waste is behaving as predicted from the Characterization and Compliance testing.

Standard TC 292 includes specific methodology for determining the leaching behavior of waste (ENV 12920). As a result of the work that has been conducted under this effort, characterization data from static pH leaching tests, column leaching tests, and tank leaching tests are available for an extensive list of materials. The list is provided in Dr. van der Sloot's presentation materials.

Dr. van der Sloot stressed that waste management, treatment and stabilization decisions should be based on long-term leaching behavior. Critical elements from a regulatory point of view can be identified by the pH static leach test in relation to the pH domain over the long term. The short test used in conjunction with preliminary characterization or compliance test data provides a sound decision basis and a cost effective means of quality control.

Dr. van der Sloot concluded that the static pH test is useful for:

- comparing the results of different leaching tests within one class of materials
- obtaining the data needed to model the behavior of geochemical controlling phases, and
- evaluating the long term behavior and impact of external stresses on materials.

Modeling forms the basis for long-term predictions. The characterization tests presented provide the input parameters for such geochemical and transport modeling. Scenario-specific and site-specific parameters can be introduced to account for different applications of the same materials and regional differences. Based on an understanding of leaching behavior, integrated concise testing protocols can be drafted for quality control and regulatory purposes.

Additional information on work being conducted by the European Community can be obtained from the Internet (www.leaching.net). The final report on the technical work that has been done for the harmonization effort should be available by the end of 1999, and will be posted on this website. Future workshops are being planned, including several upcoming events covering municipal solid waste management issues:

- REWAS September 6-9, 1999, San Sebastian, Spain.
- Landfill Symposium, October 4-8, 1999, Sardinia, Italy.
- WASCON 2000, May 31-June 2, 2000.

Dr. van der Sloot addressed comments and questions from the participants. Greg Helms, OSW, inquired about the cost of performing the suite of tests required by TC 292. Dr. van der Sloot estimated that it would cost \$1500.00 to run the tests at one pH. He advises that the test should be run in multiple configurations, including column testing, requiring about \$10,000 to complete the Characterization testing phase. On-going compliance and verification testing would cost significantly less.

Greg Helms also asked about the transferability of Characterization testing data between related waste types, such as bottom ash and fly ash. Dr. van der Sloot said that he had data showing that, in some instances, there was comparability, but that it was not always the case.

A participant asked if one should account for influences of other, co-disposed wastes, when the characterization testing is done on the waste alone. Dr. van der Sloot responded that the characteristics of the material change when co-disposed with other materials, so the characterization of the material alone was inappropriate.